DOCUMENT RESUME

ED 085 410 TM 003 351

AUTHOR	Hushak, Leroy J.
TITLE	The Contribution of School and Non-School Inputs to Student Achievement. Final Report.
INSTITUTION	Ohio State Univ., Columbus. Research Foundation.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C. Office of Research Grants.
BUREAU NO	BR-2-0653
PUB DATE	Sep 73
GRANT	OEG-0-72-1416
NOTE	65p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Academic Achievement; *Achievement Gains; *Educational Research; Grade 4; High Achievers; *Learning Processes; Low Achievers; Parent Child Relationship; Parent Influence; Questionnaires; *Resource Allocations; School Activities; Schools

ABSTRACT

The objective of this study is to estimate and analyze the relationship between learning inputs and student achievement. Emphasis is given to separating the impacts of school and non-school learning inputs. Student study time has a positive impact and time watching television a negative impact on learning practical skills such as arithmetic computations and spelling. The impact on more conceptual language and arithmetic skills is smaller and sometimes reversed. The qualitative aspects of teacher and parent teaching inputs are highly substitutable. Lower achieving students are more dependent on teachers than higher achieving students because they have less educated parents and access to fewer other non-school learning inputs. They attempt to compensate by studying more and obtaining more help from their less educated parents, but the teacher is their primary skilled teaching input. Consequently, schools have a greater marginal impact on lower achieving students. They tend to equalize achievement among all students even when poorer quality resources, in particular teachers, are allocated to lower achieving students. Greater equalization could be obtained by allocating the higher quality school resources to lower achieving students. Parent, student, school and teacher questionnaires appear in the appendix as well as several zero order correlation matrices. (Author)

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FINAL REPORT

PROJECT NO. 2-0653
GRANT NO. OEG-0-72-1416
OSURF PROJECT NO. 3474-A1

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THE CONTRIBUTION OF SCHOOL AND NON-SCHOOL INPUTS TO STUDENT ACHIEVEMENT

SEPTEMBER 30, 1973

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The research reported herein was performed pursuant to a grant with the National Institute of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official National Institute of Education position or policy.

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Preface

The author expresses appreciation to J. L. Davis and R. Rodosky of the Columbus Public Schools and to the principals, teachers, and clerks of the 20 elementary schools which participated in this project. Many insights were gained from these people in the developmental and data collection stages of the project.

In addition the author wishes to thank the members of the Workshop in Public Choice and the Political Education Forum for helpful discussions at several stages of the study.

Finally, the author expresses appreciation to Zafar Husain, research associate for the project. His assistance in data collection and his perseverance in coding and checking the data and in the computer work behind the statistical analysis were invaluable. In addition, he has contributed to the conceptualization and interpretation of many issues underlying this study.

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Introduction

The objective of this study is to further develop, estimate, and analyze the relationship between student achievement and the inputs used by students in acquiring achievement. The analysis is focused on three issues: 1) efficient allocation of learning inputs by the student or his family, 2) efficient allocation of resources by schools, and 3) efficient allocation of public resources, in particular between schools and non-school learning activities.

For the purpose of this study, student achievement is defined as cognitive abilities, or more pragmatically those abilities measured by achievement tests. This study parallels that of Hanushek [2] in its conceptualization of the student achievement production relationship and its use of individual student observations. It is unique in that an attempt has been made to obtain direct measures of student learning inputs outside of school such as time spent and participation in various non-school learning activities, time spent by parents in helping students learn, and the number of children's books and magazines present in the home.

The study area is limited to one large city school district, Columbus, Ohio, with a sample of 208 observations on fourth grade students. Therefore, the results should be viewed as exploratory.

The Achievement Production Function

The conceptual achievement production relationship underlying this study is

$$(1) \quad A_{ij} = f(T_i, S_i, NS_i, B_i, A_{oi}, IQ_i),$$

where A_{ij} = the raw score of the ith fourth grade student on the jth achievement test;

T_i = a vector of variables measuring the time spent by the student in learning activities such as time spent in school, studying outside of school, and watching TV;

S_i = a vector of school inputs such as teacher characteristics, teacher time allocation, and school facilities and characteristics;

NS_i = a vector of non-school learning inputs such as parents teaching input, books and magazines in the home, visits to museums, zoos, and other learning centers, and youth activities such as 4-H and scouts;

B_i = a vector of social background variables such as student aspirations, race, sex, parents age, family size, and family occupational status;

A_{oi} = the raw score of vocabulary plus comprehensive achievement tests of the ith fourth grade student at the beginning of the period,

IQ_i = IQ test score of the ith fourth grade student.

The specific variables included in each vector are defined in the statistical section of the paper.

Equation (1) states that the total achievement of an individual on a given achievement test (A_{ij}) is functionally determined by beginning of period achievement (A_{oi}), ability (IQ_i), the time spent in learning activities (T_i), the learning inputs to which the student has access (S_i and NS_i), and social background of the student (B_i). The lagged formulation between A_{ij} and A_{oi} is used because the achievement tests taken by students in the sample are not directly comparable and achievement gains from beginning to end of period cannot be computed. As an alternative to equation (1), A_{oi} and IQ_i are dropped as control variables in an equation in which the relationship between total achievement and T_i, S_i, NS_i, and B_i is estimated.

The problems with the use of achievement test scores to measure knowledge or cognitive skills and the use of IQ test scores to measure innate ability have been detailed by others, e.g., see Jencks [3, pp. 53-58], Bowles [1], and Kiesling [4]. The achievement and IQ test scores used in this study are subject to the same problems. However, these scores still provide the best widely available quantitative measure of the cognitive skills of students.

Recent work on student achievement attributes most of the variance in cognitive skills to social background and innate ability, with relatively little attributable to variations in school inputs; Jenck's estimate for elementary schools is less than 3 percent [3, p. 109]. 1/ However, this estimate is based on residual variance, and multi-colinearity between schools and social background will attribute much of the impact of variation in school inputs to variation in social background. If families of relatively high social background send their children to good schools, then social background will pick up the effect of good schools, especially if school inputs are not controlled in the relationship between achievement and social background.

1/ This finding implies only that schools differ little in their relative impact on students. It implies nothing about the magnitude of the impact of schools on cognitive skills.

Further, little attention has been focused on how particular elements of the social background of students affects cognitive learning and on how these elements interact with school inputs. For example, the educational level of one or both parents has been used as an indication of the educational atmosphere provided by the home, but relatively little attention has been focused on parents as teachers and the substitution between parents and teachers as teaching inputs. Any child who has a parent with at least a bachelors degree has a private teacher who is probably better qualified in one or more areas of knowledge than any of the teachers in the child's school. Such a child is less dependent on the ability of his teacher than a child with less educated parents.

Similarly, income has been used as a proxy for access to learning inputs, including those provided by schools, but little attention has been focused on which learning inputs contribute to student achievement. No previous sample of data of which the author is aware contains information on what students do outside of school. Since achievement production is a time consuming activity, those students who spend more time in learning activities outside of school are expected to make greater gains in cognitive skills. Students spend from one to 1.3 times as much time per day out of school as in school in addition to weekends and vacation periods. The observations in the sample collected for this study contain information to test the impact of a variety of non-school inputs on student achievement.

Procedures

The Columbus, Ohio school district contains about 130 elementary schools. The initial sampling objective was to obtain a sample of 200 to 250 observations on fourth grade students from 25 elementary schools. The number of schools was later reduced to 20 from 25 and the sampling rate increased for each school because of greater than anticipated collection costs.

The collection of information for each observation involved six different sources for which instruments were developed:

1) Parent consent form and parent questionnaire
2) Student questionnaire
3) School questionnaire, Part A
4) School questionnaire, Part B
5) School record information
6) Teacher questionnaire, fourth grade teachers

Copies of these instruments are in Appendix A. They were completed in three stages, each of which involved a visit to the school.

A random numbers table was used to select schools from an alphabetically numbered list of elementary schools. A total of 34 school principals were contacted to obtain 20 who agreed to participate. The most often cited reason given by principals who declined to participate was that their schools were already involved in too many research type projects.

Once a school agreed to participate, data collection proceeded in three stages. The first stage was to select the student sample in each school and distribute the parent consent form and parent questionnaire to the sample students. A copy of the teacher questionnaire was left with each fourth grade teacher who had students in the sample. Generally, twelve students were selected in each school, with some adjustment for expected response rates. If a school had only one fourth grade class, all students came from that class. If a school had more than one fourth grade class, the students sampled were divided evenly among the classes. However, a maximum of three classes were used in any school. The teachers usually selected the students, although in several schools selection was made by the principal and/or the author. Teachers were asked to randomly select students.

The sample students took the parent consent form and questionnaire home to be completed by their parents. Once these were returned to the school, stage 2 was completed. Stage 2 involved completion of all information except fourth grade achievement test scores, grades, and attendance records. The student questionnaire was administered by the author to the sample students in each school as a group. Each question was read and questions of interpretation answered on the spot. Each student's school record information was transcribed. Each school principal and/or clerk were interviewed to obtain school information, class information, and the race, sex, degree, experience, and certification of each teacher.

Finally, in stage 3 each school was revisited and fourth grade information obtained during a two-week period after classes ended and before the school buildings were closed for the summer. In retrospect, the data collection procedure appears very satisfactory. A total of 250 to 260 students were selected and given parent forms. Approximately 230 of these students returned the parent forms and completed the stage 2 data collection process. An additional 20 to 25 students were lost because of moving out of the school between stage 2 in January to March and the end of the school year or because they did not take the achievement battery of tests due to illness or some other reason. The information obtained is evaluated in the next section.

Results

This section is composed of three parts. First, the variables are defined and characteristics of the sample information are discussed. Second, the results based on equation (1) are presented and discussed. Finally, the results of the total achievement equation without lagged achievement score or IQ score are presented, discussed, and compared to the results from equation (1).

The Sample

The sample consists of 208 observations on fourth grade students in the Columbus, Ohio school system. The variables used in the analysis include six achievement test scores as dependent variables, and as predetermined variables lagged achievement test score, IQ test score, and the elements of T_i, S_i, NS_i, and B_i. The six achievement tests, taken by the students in April, 1973, are part of the California Comprehensive Tests of Basic Skills, Level 2, Form Q. The variables used in the analysis are

Voc = reading vocabulary (raw score with a maximum score of 40);

Comp = reading comprehension (raw score with a maximum score of 45);

Arith Comp = arithmetic computation (raw score with a maximum score of 48);

Arith Conc = arithmetic concepts (raw score with a maximum score of 30);

Arith App = arithmetic applications (raw score with a maximum score of 20);

Spell = language spelling (raw score with a maximum score of 30);

A_o = reading vocabulary + reading comprehension (raw score with a maximum score of 85 (40 + 45)), California Comprehensive Tests of Basic Skills, Level 1, Form Q, taken October, 1971;

IQ = IQ test score (standardized to national mean of 100 and standard deviation of 16), California Test of Mental Maturity, Level 1, taken October, 1970;

TStud4 = time spent studying at home during fourth grade (hours per day);

TStud3 = time spent studying at home during third as compared to fourth grade (0 = did not study at home in third grade, 1 = less than, 2 = about the same as, 3 = more than fourth grade);

TTV = time spent watching television (hours per day);

STeRace = 0 for non-white teachers, 1 for white teachers;

STeExp = teacher experience (years as of September, 1972);

STePrep = teacher time spent on teaching job (hours per day);

STeSing = 0 for married teachers, 1 for single teachers;

STeJob = 1 if teacher has a second job, 0 if not;

STeAdm = proportion of STePrep spent on administrative, disciplinary and other non-teaching activities (percent); 2/

SWTWS = 1 for a white child with white teacher, 0 otherwise;

SClSize = class size (number of students on interview date);

SSplit = 1 for children in 3-4 or 4-5 split grade classes, 0 for single grade classes;

SClWh = 1 for white children in all white classes, 0 otherwise;

SClL25 = 1 for white children in classes from 0.1 to 25 percent non-white, 0 otherwise;

SchSize = size of school (number of students on interview date);

SchRace = proportion of non-white students in the school (percent);

2/ Teaching activities are classroom teaching and preparation for classroom teaching.

SchLib = number of years for which a school had a library (maximum value of four);

SResPr = number of research projects in which the school participated between September, 1972 and the interview date;

NSMag = number of children's magazines to which parents subscribe (maximum value of 2);

NSHelp4 = frequency with which parents helped their child with school work during fourth grade (0 = do not help, 1 = occasionally, 2 = three to four times per week, 3 = everyday);

NSHelp3 = 1 if parents helped their child with school work during third grade, 0 if they did not help;

NSZoo = frequency with which child visits zoos, museums, and public libraries with parents (0 = does not visit, 1 = occasionally, 2 = several times a year, 3 = once a month or more);

NSFEd8 = 1 if father's education is less than high school, 0 if otherwise;

NSFEdSH = 1 if father's education is some high school but did not graduate, 0 if otherwise;

NSFEdHS = 1 if father's education is high school graduate, 0 if otherwise;

NSFEdVo = 1 if father's education is post high school technical or vocational training, 0 otherwise;

NSFEdND = 1 if father's education is some college but did not graduate, 0 otherwise;

NSFEdBS = 1 if father's education is college graduate, 0 otherwise;

NSFEdMS = 1 if father's education is Masters or other advanced degree, 0 otherwise;

BTardy = times tardy for school during fourth grade;

BNoSch = number of different schools attended;

BStAsMS = 1 if child aspires to an occupation which requires a Masters or other advanced degree, 0 otherwise;

BStAsC = 1 if child aspires to an occupation which requires post high school education but not an advanced degree, 0 otherwise;

BStAsHS = 1 if child aspires to an occupation which requires high school graduation or less, 0 otherwise;

BFriend = number of close friends (0 = none, 1 = one to three, 2 = four to six, 3 = more than six close friends);

BRace = 0 for non-white, 1 for white children;

BSex = 0 for females, 1 for males

BSAgG11 = 1 if child's age is greater than or equal to 11 years on September 30, 1972, 0 if less than 11;

BCols = 1 if child was born in Columbus, 0 otherwise;

BMetro = 1 if child was born in a metropolitan center other than Columbus, 0 otherwise;

BRural = 1 if child was born in a rural or non-metropolitan area, 0 otherwise;

BNNPar = 1 if child is in a family which does not have two natural parents, 0 if family has both natural parents;

BPEdDif = absolute value of the educational difference between parents where the scale is 1 = NSFEd8, 2 = NSFEdSH, 3 = NSFEdHS, 4 = NSFEdVo, 5 = NSFEdND, 6 = NSFEdBS, 7 = NSFEdMS for father's education and a similar scale is used for mother's education;

BFSize = brothers + sisters + stepbrothers + stepsisters of the child;

BFSizeW = BFSize for white children, 0 for non-white children;

BFSizeNW = BFSize for non-white children, 0 for white children;

BWork = 1 if both parents normally work, 0 if less than both parents work;

BWorkW = BWork for white children, 0 for non-white children;

BWorkNW = BWork for non-white children, 0 for white children;

BFAgL30 = 1 if father's age is 30 or less, 0 otherwise;

BFAg35 = 1 if father's age is 31 to 35, 0 otherwise;

BFAg36 = 1 if father's age is 36 to 40, 0 otherwise;

BFAg41 = 1 if father's age is 41 to 45, 0 otherwise;

BFAg46 = 1 if father's age is 46 or greater, 0 otherwise;

BFAgM = 1 if father's age is a missing value, 0 otherwise;

BAgDif = absolute value of age difference between parents where the father and mother age scales are 1 = less than 21, 2 = 21-25, 3 = 26-30, 4 = 31-35, 5 = 36-40, 6 = 41-45, 7 = 46-50, and 8 = over 50;

BAgDifW = BAgDif for white children, 0 for non-white children;

BAgDifNW = BAgDif for non-white, 0 for white children.

The fourth grade achievement tests were taken in April, 1973, near the end of the school year. The third grade achievement tests were taken in October, 1971 at the beginning of the third grade year. 3/ The achievement gain period results in the next part cover a period of about 18 months which includes nearly all of the third and fourth grade school years of the sample children.

Sample means, standard deviations, and ranges for continuous variables, and means or frequencies for dichotomous variables are presented in Table 1. The ranges for the six achievement test scores indicate that "topping out" may be present since two to nine students received maximum scores on all tests except reading comprehension.

3/ Columbus changed from fall to spring testing during the summer of 1972.

TABLE 1

Sample Characteristics

	No. Obs.	Mean	Standard Deviation	Range
Voc	206	26.01	8.05	7-40
Comp	206	27.82	9.35	6-44
ArithComp	207	33.41	8.77	4-48
ArithConc	208	19.07	6.36	5-30
ArithApp	208	11.93	4.60	2-20
Spell	206	19.79	6.51	2-30
A_o	187	45.18	18.98	7-84
IQ	182	105.31	12.53	60-139
TStud4	208	1.19	0.98	0-7
TStud3	208	1.77	0.81	0-3
TTV	208	4.88	2.47	0-13
STeRace	208	0.75		
STeExp	208	8.59	7.83	0-28
STePrep	208	8.87	1.28	6-12
STeSing	208	0.42		
STeJob	208	0.11		
STeAdm	208	19.78	12.59	2-55
SWTWS	208	0.61		
SClSize	208	27.91	3.93	18-35
SSplit	208	0.12		
SClWh	208	0.53		
SClL25	208	0.10		
SchSize	208	480.36	184.37	174-940
SchRace	208	32.50	37.38	0.27-100.0
SchLib	208	2.00	1.88	0-4
SResPr	208	2.26	2.18	1-9
NSMag	207	0.53	0.74	0-2
NSHelp4	208	1.42	0.86	0-3
NSHelp3	208	0.81		
NSZoo	207	1.70	0.80	0-3
NSFEd8	205	0.14		
NSFEdSH	205	0.21		
NSFEdHS	205	0.18		
NSFEdVo	205	0.15		
NSFEdND	205	0.13		
NSFEdBS	205	0.11		
NSFEdMS	205	0.08		

	No. Obs.	Mean	Standard Deviation	Range
BTardy	208	1.94	4.45	0-32
BNoSch	208	1.45	0.75	1-5
BStAsMS	205	0.13		
BStAsC	205	0.74		
BStAsHS	205	0.13		
BRace	208	0.69		
BSex	208	0.50		
BSAgG11	208	0.11		
BCols	208	0.81		
BMetro	208	0.08		
BRural	208	0.17		
BNNPar	208	0.22		
BPEdDif	205	0.99	0.96	0-5
BFSize	208	2.56	1.49	0-8
BFSizeW	144	2.43	1.43	0-8
BFSizeNW	64	2.96	1.57	0-7
BWork	208	0.50		
BWorkW	144	0.41		
BWorkNW	64	0.72		
BFAgL30	202	0.09		
BFAg35	202	0.31		
BFAg36	202	0.30		
BFAg41	202	0.30		
BFAgG46	202	0.15		
BAgDif	206	0.62	0.72	0-4
BAgDifW	143	0.57	0.67	0-3
BAgDifNW	63	0.71	0.83	0-4

White children scored higher than non-white children; the ratios of non-white to white mean test scores ranged from 0.76 on arithmetic applications to 0.85 on language spelling. However, non-white children may have gained relative to white children during the achievement gain period; the ratio of the non-white to white mean A_o is 0.71. The ratio of non-white to white mean IQ is 0.92, but this distribution is standardized and not directly comparable to the achievement test raw scores. Also, the sample changes in comparing fourth grade achievement scores to A_o and IQ since a student was not required to have A_o and IQ available to be included in the sample. Twenty-one children did not have A_o scores and 26 did not have IQ scores. 4/

Three direct time input variables are used, all from the student questionnaire. The statistics of TStud4 indicate that children studied 1.19 hours per day outside of school, with a range of zero to 7 hours. Only 16 children gave responses in excess of 2 hours per day, of which 5 children, all non-white, gave responses in excess of 3 hours per day. The mean of TStud4 was 0.98 for white children, 1.66 for non-white. The mean of 1.77 for TStud3 (2 = about the same) indicates that children studied less during third than fourth grade.

Children probably overestimated TTV. The responses from the comparable question on the parents questionnaire yielded a mean of 2.9 hours per day, with a range of zero to 6 hours. The simple correlation between TTV and the comparable parent questionnaire item is 0.33, and the distribution of responses over their respective ranges are similar. Class hours in school per day were the same for all students; days present in school exhibited no statistical impact on achievement test scores.

Teacher sex and degree are not used because there was one male teacher and nearly all teachers had bachelors degrees in the sample. The average student had a fourth grade teacher who spent 8.87 hours per day on her job (STePrep), of which 20 percent was spent on non-teaching activities (STeAdm). Third grade teacher race and experience were used in preliminary analysis, but had little effect on the reported results. They were eliminated because of missing information for children who had changed schools.

The school class racial composition, teacher race, and child race interaction variables were developed from preliminary estimates which indicated that a linear additive relationship in these variables was not adequate. Non-white child, class race interactions were eliminated because there were too few non-white students in classes less than 80 percent non-white in the sample.

4/ All of the children with missing A_o also have missing IQ. These are children who moved into the Columbus school system after the tests were given. Also, not all of the non-white children are black, although the group is predominantly black.

Several schools used variants of peer teaching, i.e., higher grade children teaching lower grade children. A dichotomous variable indicating peer teaching was tried but interacted with a number of other variables. The attempt to measure the quantity and use of audio-visual equipment was largely unsuccessful. All that resulted was a count of the number of different types of equipment, which had little variation among the schools.

In addition to NSMag in Table 1, parents were asked how many children's books they had purchased during the past year. About 85 percent responded with one book, so the variable was eliminated. The variables NSHelp4 and NSHelp3 are from the student questionnaire. The mean of the comparable item to NSHelp4 from the parent questionnaire is 1.28 (2 = three to four times a week); the distributions of responses are similar. The correlation between these two variables is 0.40. Parents reported helping their children with studies an average of 2 hours per week during fourth grade; 2.2 hours per week during third grade. 5/ There are no responses on the parent questionnaire directly comparable to NSHelp3 or NSZoo. The partially comparable item to NSZoo indicates a similar distribution.

Information was obtained on both father's and mother's education. Father's education is used because it results in a stronger statistical relationship with achievement. It is broken into a set of dichotomous variables because there appeared to be no simple continuous relationship between father's or mother's education and achievement test scores. Several other non-school learning input variables were used in preliminary analysis, such as participation in youth activities or summer camps. These variables were similar in behavior to NSZoo.

The variable BTardy in Table 1 is classified as a background variable because it is a reflection of a child's attitude toward school. The aspiration variables (BStAsMS, BStAsC, BStAsHS) were developed by classifying child occupational aspirations into the level of education required to enter the desired occupation. The variable BSAgG11 distinguishes those students who are one or more grades behind the normal age-grade level. Information on where children spent most of their life from the parent questionnaire was not used because less than 10 percent of the sample parents indicated a place other than Columbus. In contrast, about 23 percent of the sample children were born outside of Columbus (BMetro or BRural).

About 22 percent of the sample children were in families where one or both natural parents were missing, see BNNPar in Table 1. Attempts were made to distinguish among children in single parent, remarried parent, and adopted parent families, and whether these changes were because of divorce or death, but the sample is too small. Father's

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5/ When these two variables on parent help from the parent questionnaire were substituted for NSHelp4 and NSHelp3, they yielded results similar to those presented in the next two parts.

age is used as a set of dichotomous variables for the same reasons that father's education is used in this form. The variables BFSize, BWork, and BAgDif are defined to distinguish white and non-white children or families because they have different effects on white vs. non-white children's achievement test scores.

Parents desire for their child's education was eliminated as a background variable because it is highly correlated with father's and mother's education and child aspirations. Parent occupation information is poor. Since occupational information is called for on school records for each student, no occupational questions were included on the parent questionnaire. Parent occupations could not be classified for about 25 percent of the sample.6/

Achievement Gain Results

The achievement gain results are presented in Table 2. The achievement test score which is the dependent variable is indicated in the column heading. Each equation is linear-additive except for the specific interaction variables. The equations are estimated independently of one another, i.e., under strong separability assumptions, by ordinary least squares. All observations for which information is missing on one or more variables are deleted from the sample.

All equations have significant F-ratios at the 0.01 level; the range of R^2 is 0.57 to 0.78. Given the exploratory nature of the results, variables were kept in each equation if their partial F-ratios exceeded 0.1 and interactions among the predetermined variables did not develop.7/ The variable IQ is not included in the equations. Its major impact is to reduce the coefficient of A_o, which indicates that IQ tests are similar to achievement tests, in particular to Voc, Comp, and ArithConc. The zero order correlation coefficients in Table A of Appendix B support this interpretation.

The original intention was to aggregate the achievement test scores on some basis, e.g., language vs. arithmetic skills or conceptual vs. applied skills. However, there are sufficient differences among the equations in Table 2 to indicate differences in the achievement process for each of the tests, and aggregated results are not presented.8/

6/ Information was desired on children's participation in religious activities and family income. However, the Columbus school authorities viewed these as too sensitive, and religion in particular as a violation of the separation of church and state.

7/ An occasional exception to the partial F-ratio occurs when a variable enters and later has its significance reduced by other variables.

8/ An alternative to aggregation of test scores is to estimate a multiple output relationship. Experimentation with such a relationship is planned, but has not been attempted for this report.

TABLE 2

Estimated Achievement Gain Relationships with Lagged Achievement[a]

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
Constant	8.222	5.966	23.410	9.402	3.310	9.417
A_o	0.281***	0.370***	0.229***	0.259***	0.175***	0.260***
	(143.6)	(136.3)	(43.3)	(153.1)	(111.1)	(130.9)
TStud4	0.203	0.666	1.735***	0.462	0.539*	0.841**
	(0.28)	(1.62)	(8.10)	(1.80)	(3.77)	(4.72)
TStud3			0.154	-0.271	0.286	
			(0.04)	(0.42)	(0.67)	
TTV	0.064	0.111	-0.577**			-0.280*
	(0.16)	(0.28)	(5.69)			(3.20)
STeRace	2.075	3.383*	-1.840		0.946	-1.171
	(2.13)	(3.16)	(0.58)		(0.77)	(0.62)
STeExp	-0.089*	0.053	0.099	0.017		
	(3.34)	(0.66)	(1.66)	(0.15)		
STePrep	0.117	0.486	0.852*	0.159	-0.101	0.295
	(0.15)	(1.42)	(3.45)	(0.33)	(0.22)	(1.13)
STeSing	-2.146**	-2.08*	-2.375*	-1.005	-1.053*	
	(6.74)	(3.23)	(3.30)	(1.58)	(3.02)	
STeJob	-2.628*	-2.291				2.554*
	(3.33)	(1.47)				(3.17)
STeAdm	0.041	0.071	0.114**	0.094***	0.071***	-0.049
	(1.48)	(2.69)	(4.09)	(9.28)	(7.69)	(2.08)
SWTWS	-3.324	-4.424	-4.059	-2.527*	-3.630**	3.124
	(2.62)	(2.58)	(1.47)	(2.96)	(5.72)	(2.00)
SClSize	0.145		-0.308	-0.176		-0.074
	(1.28)		(2.26)	(2.63)		(0.34)
SSplit	0.555	0.592	-0.717	0.823		1.159
	(0.19)	(0.13)	(0.14)	(0.59)		(0.81)
SClWh.	2.569	4.764*	2.411		0.949	0.781
	(1.92)	(3.18)	(0.66)		(0.67)	(0.16)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
SCiL25	5.332**	6.937**	5.128	2.771**	3.217**	0.461
	(5.81)	(5.38)	(2.46)	(4.73)	(4.49)	(0.04)
SchSize	0.001		-0.002		-0.002	0.004
	(0.10)		(0.23)		(1.08)	(2.42)
SchRace	-0.026	-0.017	-0.018	-0.004		0.044*
	(1.15)	(0.26)	(0.22)	(0.05)		(3.68)
SchLib	-0.149	0.184	-0.536	-0.140	-0.255	0.125
	(0.34)	(0.29)	(1.92)	(0.37)	(2.12)	(0.32)
SResPr		0.499*		0.356*		
		(3.14)		(3.57)		
NSMag	0.245	-0.289	-0.480	-0.199	-0.162	
	(0.24)	(0.18)	(0.37)	(0.20)	(0.20)	
NSHelp4		0.734	-0.431	0.403		-1.231***
		(1.59)	(0.41)	(1.10)		(8.40)
NSHelp3	0.505	-0.292			-0.596	-1.032
	(0.34)	(0.06)			(0.89)	(1.34)
NSZoo	-0.634	-1.599***	0.304	-1.188***	-0.554*	
	(2.36)	(7.49)	(0.20)	(8.83)	(3.18)	
NSFEdSH	0.621	-0.614	-1.890		-0.912	0.474
	(0.47)	(0.27)	(1.77)		(1.94)	(0.28)
NSFEdVo	-0.320	2.135	1.207	-0.376	-0.978	-0.349
	(0.10)	(2.30)	(0.53)	(0.19)	(1.64)	(0.12)
NSFEdC[b]	-0.325	-2.134*	-0.095	-1.971***	-1.112*	-2.062**
	(0.14)	(3.30)	(0.01)	(7.12)	(2.95)	(5.47)
BTardy	0.059	0.224*	-0.257*	-0.157*	-0.026	-0.202**
	(0.37)	(3.12)	(2.91)	(3.24)	(0.15)	(4.80)
BNoSch		-1.639**	1.133	0.213	0.272	1.065*
		(5.38)	(1.96)	(0.20)	(0.47)	(3.86)
BStAsMS	0.608			0.330	0.520	0.484
	(0.33)			(0.13)	(0.46)	(0.21)
BStAsHS	-0.522	-1.841	1.016		0.799	-0.883
	(0.25)	(1.83)	(0.39)		(1.13)	(0.70)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
BRace			2.432	2.020	2.822	-4.597*
			(0.27)	(0.74)	(1.76)	(3.70)
BSex	1.430	0.509		1.324**	1.405***	-0.428
	(4.31)	(0.31)		(4.63)	(7.65)	(0.40)
BSAgG11	-1.700	-0.565	-2.188	-1.227	-0.868	1.079
	(1.84)	(0.10)	(1.23)	(1.02)	(0.86)	(0.69)
BMetro	2.172			2.562**	1.687*	
	(2.71)			(4.36)	(2.99)	
BRural	-1.906**					-0.817
	(4.16)					(0.74)
BNNPar	0.631	1.074	1.233		-0.253	-1.996**
	(0.49)	(0.75)	(0.75)		(0.15)	(4.85)
BPEdDif	0.719**	0.385	0.335		0.224	0.394
	(4.33)	(0.69)	(0.36)		(0.68)	(1.22)
BFSizeW		0.258	0.874*	0.666**	0.421*	0.574*
		(0.47)	(3.36)	(5.84)	(3.41)	(3.61)
BFSizeNW	-0.864**	0.209	0.483	0.218	0.165	
	(5.61)	(0.17)	(0.42)	(0.29)	(0.24)	
BWorkW	0.799	-0.809	0.528	0.633	0.282	0.812
	(0.94)	(0.55)	(0.17)	(0.72)	(0.21)	(0.97)
BWorkNW	1.343	-0.709	-0.776	-1.210	-0.539	-0.519
	(1.03)	(0.16)	(0.13)	(0.95)	(0.30)	(0.14)
BFAgL30		-4.262**		-0.399		-3.149**
		(5.36)		(0.10)		(4.99)
BFAg40[c]		-2.435**		-0.623	-0.594	-1.603*
		(5.92)		(0.63)	(0.93)	(3.52)
BFAgG46	0.442		3.725**	1.227	1.299	-0.646
	(0.22)		(5.91)	(1.43)	(2.74)	(0.32)
BFAgM	5.342	4.561		1.852		
	(2.52)	(1.08)		(0.36)		
BAgDifW	-2.135***	-1.137	-1.494	-1.069*	-0.777*	-1.204**
	(13.48)	(2.08)	(2.68)	(3.91)	(3.05)	(3.99)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
BAgDifNW	1.475*	1.038	-1.385	0.332		-0.613
	(3.83)	(1.12)	(1.39)	(0.24)		(0.68)
R^2	0.78	0.73	0.57	0.71	0.64	0.69
Adj. R^2	0.72	0.66	0.46	0.64	0.56	0.60
F	12.38***	9.62***	5.01***	9.72***	7.34***	7.99***
Obs.	176	176	177	178	178	176

[a] Partial F-ratios in parentheses.

[b] NSFEdC = NSFEdND + NSFEdBS. NSFEdHS and NSFEdMS are part of the control group.

[c] BFAg40 = BFAg36 + BFAg41

* Significant at .10 probability level, F(1,120) = 2.75

** Significant at .05 probability level, F(1,120) = 3.92

*** Significant at .01 probability level, F(1,120) = 6.85 and F(30,120) = 1.86

The coefficient of A_o is positive and significant in all equations. It is proportional to the possible maximum test score in all equations except ArithComp, which indicates that the reading vocabulary and comprehension tests taken in third grade are least indicative of skills measured by ArithComp.

The coefficients of TStud4 are positive in all equations, and significant at the .10 probability level or higher for ArithComp, ArithApp, and Spell. These three tests are more application oriented than the other three, and learning applications is expected to be benefited more by direct study effort. The coefficient of TStud4 in ArithComp indicates that an increase of one hour of study per day would increase raw score by 1.7 points. The coefficients of TTV are supportive. The time a child watches television is neutral with respect to Voc, Comp, ArithConc, and ArithApp, but has a negative impact on ArithComp and Spell.

The impacts of the race variables cannot be completely disentangled, but some conclusions are possible. The coefficient of school racial composition (SchRace) is negative except for Spell where it is positive. The coefficient of SchRace in Voc indicates that students in all white schools score 2.6 raw score points more than students in all non-white schools. The positive coefficient of STeRace in Voc and Comp indicates that non-white students benefit from white teachers in learning language skills, perhaps because white teachers have greater facility with the English language as taught in schools than non-white teachers. However, this advantage does not carry over to arithmetic skills or Spell, nor does it hold for white students where the negative coefficient of SWTWS more than offsets the positive coefficient of STeRace in Voc and Comp. White children may learn these skills from their parents or other associations outside of school. With respect to arithmetic skills and Spell, non-white teachers are as effective or more effective than white teachers.

Given the teacher race impacts, the coefficients of BRace indicate that white children make greater gains in arithmetic skills and lesser gains in Spell. However, in Spell, BRace and SWTWS may be interacting. The coefficients of SClWh and SClL25 indicate that white students in classes less than 25 percent non-white make greater achievement gains than white students in classes more than 25 percent non-white. However, the number of white students in classes more than 25 percent non-white in the sample is small.

Teacher experience (STeExp) has a relatively small impact on achievement scores. Single teachers (STeSing) have a negative impact on all test scores except Spell. Single teachers tend to have less experience, but the correlation between these two variables is only -0.13. The hours per day that teachers spend on their teaching job (STePrep) has positive coefficients for all test scores except ArithApp, but is significant at the 0.10 level only for ArithComp. A teacher who holds a second job (STeJob) has a negative impact on Voc and Comp and a positive impact on Spell. The correlation between STePrep and STeJob is -0.10. An unexpected result is the positive impact of

STeAdm on test scores, except for Spell. The two major components of STeAdm are the proportion of time spent on administration (school records, committees, etc.) and discipline, with discipline accounting for the larger part of the variation in the variable.

Class size has a marginally significant positive impact on Voc and a negative impact on ArithComp and ArithConc. The impact of split classes (SSplit) is small. All split classes in the sample were 4-5 grade splits with the exception of one 3-4 split. Generally, the higher achieving students are put into split classes when such classes are necessary. One interpretation is that the benefits of being in class with higher achieving students are offset by the smaller amount of time the teacher can spend on each class since she must prepare for two classes.

The SchSize and SchLib variables have marginal impacts on achievement test scores. The number of research projects in which the school had participated (SResPr) has a positive effect on Comp and ArithConc. This variable is a measure of the school atmosphere and of the number of outside persons who come into the school.

The non-school input variables NSMag, NSHelp4, and NSHelp3 all have marginal impacts on achievement test scores. The NSHelp4 coefficient is negative in Spell where it is significant. The correlation coefficients between NSHelp4 and the achievement test scores all exceed -0.20 in absolute value. Lower achieving students receive more parental help. However, this may be lower quality help since more help tends to be given by less educated parents. The frequency with which children attend zoos, museums, etc. with their parents (NSZoo) is also negatively related to test scores. It is possible that NSZoo is a beneficial activity and there are not sufficient controls in the equations to yield the positive relationship. However, participation in youth activity and summer camp variables yielded similar results.

The impact of father's education on achievement gains is very mixed. The variables NSFEdHS and NSFEdMS were put into the control group with NSFEd8 because they had coefficients close to zero in all equations. The basic conclusion is that the schools effectively neutralize the impact of educated parents on achievement gain. This will be discussed in more detail in the total achievement part of the report.

A child who is more often tardy (BTardy) tends to score lower on arithmetic tests and Spell. However, the impact of BTardy on Voc and Comp is neutral or positive. The variable BTardy is a proxy for the child's attitude toward school. The coefficients of BNoSch may reflect the type of school in which children have been more than the problems of changing schools. Those students who have attended more than one

school scored lower on Comp and higher on ArithComp and Spell. Student aspirations are not significant. Students who aspire to occupations requiring only high school do not make smaller achievement gains in all areas than students aspiring to occupations requiring college education.

Male students make greater achievement gains except in ArithComp and Spell. The coefficients of BSAgG11 are negative as expected, except for Spell. Children born in metropolitan areas other than Columbus make greater gains than Columbus born children in Voc, ArithConc, and ArithApp. Children born in rural areas do less well in Voc and Spell.

Children in families where one or both natural parents are not present (BNNPar) achieve less only in Spell. This result indicates that family tragedies have no long run impact on achievement. The educational difference between parents (BPEdDif) is positive throughout, but significant only for Voc.

Family size has different effects on white and non-white children. White family size (BFSizeW) has positive and significant coefficients for the arithmetic tests and Spell. Non-white family size (BFSizeNW) is negative and significant in Voc. The reason for these differences is unknown. The impact of whether or not both parents normally work (BWorkW and BWorkNW), also differs between white and non-white children. The impact is generally positive in white families and negative in non-white families. A possible explanation of this result is that there may be less pressure to earn additional income in white than non-white families. The second parent in a white family will often work only when other responsibilities can be fulfilled as well, while in non-white families it may more often be necessary for the second parent to work to achieve a minimum adequate income.

Children with young fathers(BFAgL30) and with fathers of age 36-45 make less achievement gain than children with fathers of age 31-35 (control group) or over 46 (BFAgG46). Again, white and non-white families differ with respect to the impact of parent age difference on achievement. A greater age difference between parents of white children (BAgDifW) has a negative effect on achievement gain, while there is a positive effect for non-white children. The reason for the differential impact is unknown.

Total Achievement Results

The total achievement results are presented in Table 3. All equations have significant F-ratios at the 0.01 level; the range of R^2 is 0.46 to 0.60. The difference between these results and those of Table 2, and a major difference, is that A_0 is dropped from the relationships. The discussion is limited to those variables which have substantially different impacts as compared to the achievement gain results in Table 2.

TABLE 3

Estimated Total Achievement Relationships[e]

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
Constant	33.912	39.587	47.302	30.740	19.208	34.925
TStud4	-0.247		1.115*		0.422	0.494
	(0.23)		(2.83)		(1.50)	(1.01)
TStud3		-0.487	0.304		0.381	-0.295
		(0.37)	(0.15)		(0.81)	(0.28)
TTV		0.192	-0.512*			-0.333
		(0.48)	(3.45)			(2.70)
STeRace	1.473	1.300	-0.450	-1.092	-0.208	-2.353
	(0.57)	(0.26)	(0.03)	(0.35)	(0.02)	(1.53)
STeExp	-0.146**	-0.048	0.015	-0.053	-0.056	-0.068
	(4.51)	(0.27)	(0.03)	(0.71)	(1.37)	(1.10)
STePrep	-0.171	-0.077	0.456		-0.242	
	(0.18)	(0.02)	(0.81)		(0.79)	
STeSing	-3.801***	-4.684***	-2.892**	-1.941**	-2.088***	-1.538*
	(11.86)	(13.26)	(4.04)	(4.90)	(7.40)	(2.86)
STeJob	-6.187***	-7.627***	-5.368**	-4.298***	-2.950**	-2.265
	(11.85)	(11.52)	(5.42)	(7.45)	(5.76)	(1.80)
STeAdm	0.036	0.047	0.157**	0.098**	0.076**	-0.073
	(0.64)	(0.60)	(6.56)	(5.43)	(5.40)	(2.70)
SWTWS	-3.650	-4.954	-7.124*	-2.674	-3.714*	2.210
	(1.88)	(1.98)	(3.22)	(0.94)	(3.00)	(0.60)
SClSize	0.282	0.195	-0.191	-0.151	0.061	-0.028
	(2.06)	(0.58)	(0.56)	(0.78)	(0.20)	(0.02)
SSplit	0.879		-1.290	0.214	-0.380	1.088
	(0.27)		(0.36)	(0.02)	(0.11)	(0.49)
SClWh.	3.380	5.430	-0.249	-1.182	0.604	3.192
	(1.77)	(2.37)	(0.01)	(0.21)	(0.09)	(2.10)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
SC1L25	8.582***	11.345***	4.656	2.949	4.363**	5.191*
	(9.14)	(9.03)	(1.46)	(1.14)	(4.57)	(3.54)
SchSize	-0.007*	-0.009*	-0.010*	-0.005	-0.006*	-0.003
	(3.24)	(2.92)	(3.50)	(2.17)	(3.48)	(0.46)
SchRace	-0.067**	-0.074*	-0.098**	-0.067**	-0.041*	
	(4.45)	(3.21)	(5.01)	(5.44)	(3.26)	
SchLib	-0.299		-0.376		-0.254	
	(0.70)		(0.66)		(1.07)	
SResPr	-0.618*	-0.478	-0.408	-0.180	-0.417*	-0.355
	(3.80)	(1.53)	(0.95)	(0.46)	(3.48)	(1.73)
NSMag	0.768	0.798	0.482	0.610	0.270	0.665
	(1.29)	(0.82)	(0.32)	(1.02)	(0.34)	(1.10)
NSHelp4	-0.611	-0.342	-1.513**	-0.534	-0.355	-1.951***
	(1.21)	(0.22)	(4.62)	(1.10)	(0.86)	(13.98)
NSHelp3	-0.568	-1.018		-0.428	-0.898	-1.493
	(0.23)	(0.42)		(0.16)	(1.19)	(1.75)
NSZoo	-0.469	-1.297*	-0.348	-0.822	-0.508	
	(0.64)	(2.91)	(0.22)	(2.52)	(1.59)	
NSFEdSH	1.503	0.446	0.433	1.425	-0.594	1.585
	(0.93)	(0.05)	(0.05)	(0.98)	(0.50)	(1.08)
NSFEdHS	1.943	2.946	3.778*	2.192	1.158	3.070*
	(1.38)	(1.79)	(3.17)	(2.13)	(1.83)	(3.89)
NSFEdVo	1.329	4.937**	2.844	1.836		1.783
	(0.60)	(4.69)	(1.62)	(1.32)		(1.10)
NSFEdND	2.026	1.998	1.955	0.051		2.191
	(1.27)	(0.69)	(0.72)	(0.00)		(1.64)
NSFEdBS	4.609**	5.072**	4.159*	4.009**	2.250**	1.489
	(5.78)	(3.99)	(2.78)	(5.26)	(4.11)	(0.64)
NSFEdMS	4.328*	6.010**	4.732	5.921***	3.430***	2.697
	(3.91)	(4.14)	(2.64)	(8.71)	(6.88)	(1.64)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
BTardy		0.078	-0.241*	-0.162		-0.239**
		(0.29)	(2.76)	(2.63)		(5.72)
BNoSch	-1.187*	-2.649***	-0.392	-0.418	-0.228	
	(3.61)	(9.60)	(0.23)	(0.54)	(0.27)	
BStAsMs	1.441		1.606	1.272	1.035	1.892
	(1.08)		(0.84)	(1.08)	(1.18)	(2.07)
BStAsHs	-0.678	-2.383	2.468		0.847	-0.625
	(0.26)	(1.85)	(2.01)		(0.83)	(0.23)
BFriend			0.742	0.542		-0.367
			(0.96)	(1.09)		(0.42)
BRace			2.001	2.474	2.752	-5.415
			(0.16)	(0.50)	(1.11)	(2.16)
BSex		-1.617	-0.876		0.279	-1.531*
		(1.87)	(0.60)		(0.22)	(3.27)
BSAgGll	-3.618**	-4.407*	-3.963*	-3.187**	-2.759**	
	(5.10)	(3.78)	(3.28)	(4.64)	(6.51)	
BMetro		-2.031	-2.208			-1.730
		(0.85)	(1.00)			(1.13)
BRural	-1.548				-0.461	
	(1.61)				(0.30)	
BNNPar		0.952	-0.496	-0.802	-0.937	-1.580
		(0.38)	(0.11)	(0.56)	(1.35)	(2.09)
BPEdDif	0.576	0.598	0.435		0.146	0.566
	(1.45)	(0.86)	(0.49)		(0.19)	(1.51)
BFSizeW	-0.934**	-0.295				
	(6.66)	(0.38)				
BFSizeNW	-1.566***	-0.706	-0.610	-0.507	-0.444	-0.855
	(9.76)	(1.12)	(0.60)	(0.84)	(1.22)	(2.15)
BWorkW	-0.721	-1.997	-0.787	-0.464	-0.548	-0.716
	(0.41)	(1.80)	(0.31)	(0.22)	(0.55)	(0.47)

	Voc	Comp	Arith Comp	Arith Conc	Arith App	Spell
BWorkNW		-2.151	-3.179	-1.755	-0.954	-0.831
		(0.84)	(1.88)	(1.12)	(0.56)	(0.23)
BFAgL30	-0.757	-3.326	2.608			-2.517
	(0.21)	(2.16)	(1.40)			(2.40)
BFAg36		-2.049	1.539			-1.018
		(1.56)	(0.99)			(0.82)
BFAg41	-2.904**	-5.661***	-0.820	-2.013	-2.129**	-2.677*
	(4.79)	(7.40)	(0.17)	(2.70)	(5.26)	(3.50)
BFAgG4		-0.850	3.536*	1.268	1.339	-0.493
		(0.18)	(3.73)	(1.07)	(2.05)	(0.14)
BFAgeM	3.134	3.140		1.634		
	(0.47)	(0.26)		(0.17)		
BAgDifW	-1.173		-0.584	-0.789	-0.351	-0.402
	(2.14)		(0.33)	(1.22)	(0.41)	(0.27)
BAgDifNW	2.566***	2.531*		0.816	0.558	
	(7.08)	(3.44)		(0.75)	(0.62)	
R^2	0.60	0.53	0.49	0.49	0.46	0.48
Adj. R^2	0.49	0.40	0.33	0.36	0.32	0.34
F	5.60***	3.93***	3.08***	3.89***	3.20***	3.36***
Obs.	193	193	193	193	193	193

[a] Partial F-ratios in parentheses.

* Significant at .10 probability level, F(1,120) = 2.75

** Significant at .05 probability level, F(1,120) = 3.92

*** Significant at .01 probability level, F(1,120) = 6.85 and F(40,120) = 1.76

There is a much stronger negative relationship between achievement and single teachers (STeSing) and teachers with second jobs (STeJob) in Table 3 than in Table 2. While causality of STeSing and STeJob on achievement gain can be argued, one cannot argue that single teachers or teachers who have second jobs cause lower total achievement of their students in excess of that found in the achievement gain results. Single teachers and teachers with second jobs do teach lower achieving students in this sample. The correlation of achievement test scores with STeSing ranges from -0.23 for ArithApp to -0.33 for Voc, and with STeJob from -0.12 for ArithComp to -0.20 for Voc. This may explain the negative coefficients of Table 2 as well.

The coefficients of SchSize and SchRace are consistently negative and of greater magnitude in Table 3. The coefficients of the number of research projects (SResPr) are all negative in Table 3. Larger schools, non-white schools, and schools with more research activity tend to be schools with lower achieving students. The smaller coefficients of SchSize and SchRace and the positive coefficients of SResPr in Table 2 as compared to Table 3 indicate that schools do equalize the rate of achievement gain among students.

The set of father's education variables show the greatest differences between Tables 2 and 3. In Table 2 the coefficients of the father's education variables were small and often negative for more highly educated parents. In Table 3, the coefficients of the father's education variables are positive and generally increase, although not monotonically, with higher levels of father's education. There are two possible explanations. First, the increasing coefficients may be due to increasing levels of inherited ability. However, if inherited ability were the predominant influence, increasing coefficients on father's education variables in the achievement gain results would also be expected, i.e., more able students should make greater achievement gains than less able students.

The second explanation is that more highly educated parents provide greater or higher quality teaching input for their children. In school these children mark time while children with less educated parents learn skills they have already learned. A child with less educated parents may learn more from a "poor" teacher than a child with highly educated parents does from a "good" teacher. 9/ The child with less educated parents does not have access to alternative skilled teaching inputs, and the teacher is the most skilled teaching input to which the child has access regardless of the teacher's qualifications.

9/ This is not an argument that schools should allocate "poor" teachers to children with less educated parents. This explanation leads to the expectation that such children benefit more from good teachers than children with highly educated parents.

The results in Table 2 indicated that male children made greater achievement gains than females. The results in Table 3 indicate that female children are still at higher total achievement levels at the end of fourth grade than males in Comp, ArithComp, and Spell. The impact of family size and both parents working is negative for both white and non-white children in Table 3, although the impact is stronger on non-white children.

Conclusions

In concluding this report an attempt is made to do four things: 1) to assess the feasibility of further studies of this type; 2) to draw general conclusions from the results with emphasis on variations in the process of acquiring the various skills; 3) to compare the results of this study to previous work, and 4) to draw implications of the study for resource allocation.

A major concern from the beginning of this study was whether much of the desired information could be obtained at all, and further whether it would be sufficiently related to reality to provide reliable results. Involvement in the data collection process and the statistical results have convinced the author that parents and students did provide sufficiently accurate information, on time inputs in particular, to yield useful results. If the learning process is to be understood, such information is vital. Further, the data collection costs are not prohibitive, especially if interviews or testing are already part of the data collection process.

The learning process appears to be less formal for the more conceptual skills (vocabulary, comprehension, and to some extent arithmetic concepts) than for the more applied skills. Children learn language skills from a wide variety of sources, many of them informal, while the more applied skills require concentrated effort. Study time has a positive and significant impact on arithmetic computations, arithmetic applications and spelling; a positive but not significant impact on vocabulary, comprehension and arithmetic concepts. Television has a marginally positive impact on conceptual skills, but a significant negative impact on applied skills. A child's attitude toward school as measured by times tardy is neutral with respect to the more conceptual skills, but has a negative impact on applied skills.

Interactions exist among child race, teacher race, and class racial composition, but the sample is too small to satisfactorily separate them. White students have higher achievement test scores than non-white students as a group, but when other factors are controlled in the achievement relationships, this advantage remains only for the arithmetic tests. Non-white children benefit from white teachers in learning vocabulary and comprehension, perhaps because white teachers have greater facility with the English language. This effect does not carry over to the other tests or to white children.

To assess the relative impacts of inherited ability, environment, and schools on achievement, the achievement gain and total achievement results must be compared. If only the achievement gain results are considered, it is quite easy to conclude that inherited ability is the major factor, followed by environmental factors. If only the

total achievement results are examined, a similar conclusion emerges if father's education is interpreted as a measure of inherited ability. An additional possible conclusion is that poor schools are large schools, schools with a large component of non-white students, and schools with a large proportion of teachers who are single and/or hold a second job.

When the two sets of results are compared, however, a significantly different picture emerges. If more able children are capable of more rapid achievement gains and father's education is a measure of inherited ability, then the positive impact of father's education in the total achievement results should carry over to the achievement gain results. It does not. The achievement gain results imply that the children of more highly educated fathers make smaller achievement gains. An interpretation consistent with these results is that father's education is the qualitative aspect of parent's teaching input, and that it is highly substitutable for the teacher input of schools. Children with more highly educated parents are not as dependent on school inputs, nor do they spend as much time studying outside of school. Children with less educated parents attempt to compensate by spending more time studying outside of school; the correlation between study time and father's education, and study time and achievement test scores, are consistent with this. Less educated parents also attempt to compensate by providing more help in terms of time. However, the children of less educated parents are still more dependent on the teacher as their primary skilled input.[10/]

Further comparisons of the two sets of results which lend support to this interpretation are the reductions in the magnitude of the school size and racial composition effects, some of the teacher effects, and the differential impact of research projects. These results are consistent with the interpretation that schools with lesser achieving students do compensate at least in part for the disadvantaged backgrounds of their students, and help them make achievement gains which approach those of higher achieving students.

With respect to resource allocation, parents and children do respond to forces affecting achievement. The obvious recommendation to parents is to provide, when possible, access for their children to persons skilled in language. However, this recommendation is made with caution because the obvious means of providing this opportunity is through youth clubs, summer camps, and libraries. The results with respect to these activities are not encouraging.

10/ This is not an argument that inherited ability does not vary among children, but only that it is largely unrelated to father's (or mother's) education in this study.

If the objective of schools is to equalize educational opportunity, they should allocate more and/or higher quality resources to lower achieving students. These students are likely to be more dependent on school inputs because they have less educated parents and access to fewer learning activities outside of school than do higher achieving students.

The conclusion of recent studies such as Jencks' that school input variations have little impact on achievement can now be put into perspective. Based on the results and interpretation of this study, a more accurate statement of this conclusion is that schools have a greater marginal impact on low achieving students as compared to high achieving students, even if fewer or lower quality resources are allocated to these students, because they have fewer alternative sources of learning inputs.

At a more general level, the role of learning insitutions and opportunities, other than public schools, needs to be carefully analyzed. The relatively narrow range of skills measured by the achievement tests of this study imply substitutions and interrelationships between skills, i.e., learning one skill often reduces the ability to learn another, and between the school and the home in the learning inputs provided. Other skills, such as cultural skills, are likely to be learned from a still broader array of opportunities.

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APPENDIX A

Data Collection Instruments

Appendix A contains all the instruments used in the data collection process. Included are:

1) Cover letter to parents

2) Parent consent form

3) Parent questionnaire

4) Student questionnaire

5) School questionnaire, Part A

6) School questionnaire, Part B

7) School record information

8) Teacher questionnaire, fourth grade teachers

November 16, 1972

Dear Parent:

I would like to include your son/daughter in a study entitled, "The Contribution of School and Non-School Inputs to Student Achievement". My major purpose is to obtain further information on where and how students learn. How much difference do teachers and school facilities make in learning? How important are parental guidance, reading beyond school requirements, or visits to museums and zoos to student achievement?

Other studies of this type have had difficulty in separating the effects of schools and social background on student learning. In other words high achieving students tend to go to good schools and come from wealthy neighborhoods. However, I do not believe that we have gotten to the basic causes of student learning. I hope to come a step closer by obtaining detailed information on what kinds of learning activities children take part in outside of school and how much time they devote to these activities. Hopefully, this study will contribute to our knowledge of two important questions. How can parents further their contribution to the growth of their children? How can schools more effectively use public money to enhance student achievement?

The study is a relatively small one, limited to the Columbus Public School System. I hope to obtain information on 200 to 250 fourth grade students from 25 different elementary schools, randomly selected. Your son/daughter has been selected to participate. Participation involves completion of the parent questionnaire included with this material, completion of the questionnaire by your child in school and permission to use the information contained in your child's records by the school. In addition, I will be obtaining information on the school and on each teacher your son/daughter has had in the Columbus schools. If you are willing to participate and allow your son/daughter to participate, please complete the consent form and the parent questionnaire, and have your son/daughter return it to school.

Sincerely,

Leroy J. Hushak
Project Director

LJH/clm

Enclosures

RESEARCH INVOLVING HUMAN SUBJECTS

CONSENT TO SERVE AS A SUBJECT IN RESEARCH

I consent to serve as a subject in the research investigation entitled: The Contribution of School and Non-School inputs to Students Achievement. I also authorize the service of _____ _____ as a subject in this research investigation.

The nature and purpose of the students and parent questionnaires are adequately explained in the cover letter. I understand that the aboved named child will be given a pre-service explanation of the research and that he/she may decline to serve. I understand my identity and that of my child will not be revealed in any publication or document resulting from this research.

Signed _____

Date _____

PARENT QUESTIONNAIRE

Date: _____

1. Child's Name: _____ _____ _____
   (Last) (First) (Middle)

2. Home Address: _____

3. How many miles is your residence from the school which this child attends?

   1. Less than one mile
   2. One to three miles
   3. More than three miles

4. Where has this child spent most of his/her life?

   Name of Place: _____

5. Father's educational level:

   1. Less than high school
   2. Attended high school but did not graduate
   3. Graduated from high school
   4. Technical (non-college) training
   5. Attended college but did not graduate
   6. Graduated from college
   7. Received Masters or PH.D. degree

6. Mother's educational level:

   1. Less than high school
   2. Attended high school but did not graduate
   3. Graduated from high school
   4. Technical (non-college) training
   5. Attended college but did not graduate
   6. Graduated from college
   7. Received Masters or PH.D. degree

7. Do both parents normally work?

   1. Yes
   2. No

8. How many brothers and/or sisters does this child have?

   0. None
   1. One
   2. Two
   3. Three
   4. Four or more

9. How many stepbrothers and/or stepsisters does this child have?

   0. None
   1. One
   2. Two
   3. Three
   4. Four or more

10. What was the father's age on his last birthday?

    1. Less than 21
    2. 21 - 25
    3. 26 - 30
    4. 31 - 35
    5. 36 - 40
    6. 41 - 45
    7. 46 - 50
    8. 51 - 55
    9. over 55

11. What was the mother's age on her last birthday?

1. Less than 21	4. 31 - 35	7. 46 - 50
2. 21 - 25	5. 36 - 40	8. 51 - 55
3. 26 - 30	6. 41 - 45	9. Over 55

12. About how many hours per day does this child watch TV? _____

13. About how many hours per day does this child listen to the radio?

_____

14. Does this child belong to

1. Cub Scouts
2. Boy or Girl Scouts
3. Y.M.C.A. or Y.W.C.A.
4. Other, specify: _____

15. Does this child take part in any activities of one or more of the above organizations?

1. Yes
2. No

16. Did this child go to summer camp last summer?

1. Yes
2. No

17. Did this child go to summer camp during previous years?

1. Yes
2. No

18. Do you or your spouse help this child in his/her studies at home?

1. Yes
2. No

19. If yes, how often do you or your spouse help this child in his/her studies at home?

    1. Everyday

    2. Three to four times a week

    3, Occasionally

20. Approximately how many hours per week do you or your spouse help this child in his/her studies at home? _____

21. Did you help about the same number of hours/week a year ago?

    1. Yes

    2. No

22. If no, how many hours/week did you help this child? _____

23. How many books (other than text books) have you bought for this child during the last year?

    1. None

    2. One

    3. Two or more

24. Do you currently subscribe to children's magazines?

    1. Yes

    2. No

25. If yes, how many magazines?

    1. One

    2. Two or more

26. Who selects the magazines or books?

    1. Your children

    2. You or your spouse

    3. Both of the above.

27. How often have you taken this child (as well as others) to museums, zoos, or public libraries during the last year?

    1. Once a week
    2. Once a month
    3. Once or twice a year
    4. Less than above

28. Do you or your spouse discuss politics, the Vietnam war, pollution, etc, with your children?

    1. Yes
    2. No

29. Do you discuss family decisions with your children?

    1. Yes
    2. No

30. What do you desire for this child's education?

    1. Attend high school
    2. Go to business college
    3. Vocational/technical school
    4. Junior college
    5. Four-year college
    6. University (post-graduate education)

STUDENT QUESTIONAIRE

Date: _____

1. Your Name: _____ _____ _____
   (Last) (First) (Middle)

2. Name of your school: _____

3. Do you study at home?

   1. Yes

   2. No

4. If yes, how many hours per day do you spend studying at home? _____

5. Did you spend more, about the same, or less time studying at home last year?

6. Do you watch TV at home?

   1. Yes

   2. No

7. How many hours per day do you watch TV? _____

8. Do you listen to the radio?

   1. Yes

   2. No

9. If yes, how many hours per day do you listen to the radio? _____

10. Do you learn about politics (elections, party conventions, the President of the United States, Congress), environmental pollution, the Vietnam war, and other problems from (Circle all for which your answer is yes):

    1. TV

    2. Radio

    3. Your own reading

    4. Your parents

    5. Your teachers

11. If you have questions about these things, whom do you ask? (Circle those applicable)

    1. Your parents

    2. Your teachers

    3. Your friends

12. Do you discuss things like politics, the Vietnam war, or environmental pollution in your (Circle those for which your answer is yes):

    1. Home (Family discussions)

    2. Class at school with teachers

    3. School with your friends

13. When you want to do something, do your parents discuss it with you?

    1. Yes

    2. No

14. Are you a member of the Cub Scouts, YMCA, YWCA, or other activities?

    1. Yes

    2. No

15. If yes, do you take part in your club's functions and activities?

    1. Yes

    2. No

16. Did you go to a summer camp last summer?

    1. Yes

    2. No

17. Did you go to a summer camp the summer before last?

    1. Yes

    2. No

18. Do your parents help you with your school work?

    1. Yes

    2. No

19. If yes, how often do your parents help you with your school work?

    1. Everyday

    2. Three to four times per week

    3. Occasionally

20. How many hours per day do your parents help you with your school work? _____

21. Did your parents help you with your school work last year?

    1. Yes

    2. No

22. If yes, did they help you more, about the same, or less than this year?

23. Have you gone to the following places?

    1. Museums

    2. Public libraries

    3. Zoos

24. With whom have you gone to these places? (Circle those applicable)

    1. Your parents

    2. Teacher from your school

    3. Your friends

25. If you have been to these places with your parents, how often?

    1. Once a month or more

    2. Several times a year

    3. Occasionally

26. How many close friends do you have?

    1. One to three friends
    2. Four to six friends
    3. More than six friends

27. How many new friends have you made during the past year? _____

28. How many of your close friends have moved away during the past year? _____

29. What would you like to be when you grow up? _____

30. Whom do you admire most?

    1. Your father
    2. Your mother
    3. Your teacher
    4. One of your friends
    5. If any other person, please specify: _____

SCHOOL QUESTIONNAIRE

PART A -- complete for school

1. Name of School: _____

2. School enrollment, Fall, 1972: _____

3. Number of black or other minority students in the school: _____

4. Does the school have a library?

   1. Yes
   2. No

5. How many years has the school had a library?

   1. One year
   2. Two years
   3. Three years
   4. Four or more years

6. Kindly list the kinds of audio-visual equipment in the school and the years for which they have been available.

Audio-visual equipment	No. of years available
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

7. Is the Audio-visual equipment used by the teachers in their classes

   1. Regularly?

   2. Very often?

   3. Occasionally?

8. Do the students (1st - 4th graders) have access to this Audio-visual equipment

   1. Regularly?

   2. Very often?

   3. Occasionally?

SCHOOL QUESTIONNAIRE

PART B - complete for each student in sample

1. Name of School: _____

2. Name of Student: _____

3. Fourth grade class composition, 1972-73

   A. Class hours per day _____

   B. Number of students in class _____

   C. Number of non-white students in class _____

4. Third grade, 1971-72.

   A.

   B.

   C.

5. Second grade, 1970-71.

   A.

   B.

   C.

6. First grade, 1969-70.

   A.

   B.

   C.

SCHOOL RECORD INFORMATION

A.

Items	Grades							
	I		II		III		IV	
1. Achievement Scores								
2. I. Q. Test Scores								
3. Grade Average for Courses:								
a. Group A Courses 1/								
b. Group B Courses 2/								
c. Group C Courses 3/								
4. Hours/Day Spent in Classroom								
5. Number of Days Absent								
6. Number of Days Tardy								
7. Number of Days Present								
8. Number of Schools Attended								
9. Number of Days of Illness and Accidents								
10. Youth Club:								
a. Participation								
b. Activities								

1/ Arithmetic, Social Studies, Geography, History, Science

2/ Reading, Language, Spelling, Writing, Art, Music

3/ Personal Social Growth, Physical Education, Work Habits, Social Habits

B. FAMILY BACKGROUND

Items

1. Place of birth

2. Date of birth

3. Occupation of:

   a. Father

   b. Mother

   c. Step-father

   d. Step-mother

   e. Guardian

4. Marital Status of:

	Single	Married	Separated	Divorced	Widowed
a. Father					
b. Mother					
c. Step-father					
d. Step-mother					
e. Guardian					

C. TEACHER INFORMATION

Grade/Items	Sex	Race	Highest Degree Received	Years of Teaching Experience	Certified Teacher	Uncertified Teacher
Grade I						
Grade II						
Grade III						
Grade IV						

TEACHER QUESTIONNAIRE
Fourth Grade Teachers

1. Approximately how many hours per day do you devote to your job as a teacher in this school? _____

2. In a typical day, about how much or what proportion of your time do you spend in (specify hours or percent)

   a. Teaching _____

   b. Preparation for teaching _____

   c. Administration (student records, committees, etc) _____

   d. Disciplinary activities _____

   e. Other (specify) _____

3. What is your marital status?

   a. Single

   b. Married

   c. Other (specify)

4. Do you have a second job in addition to your job as a teacher in this school?

   a. Yes

   b. No

5. Which political events or problems do you discuss with your students (circle all applicable)?

   a. Elections and conventions

   b. Taxes

   c. Vietnam

   d. Pollution

   e. Other (specify) _____

   f. Do not discuss political events

6. On which of these do you assign reading or other preparatory work? (Please list)

7. Do you think that what students learn at home or outside of school (TV, radio, their own reading, discussions at home) makes your job more difficult? Why?

APPENDIX B

TABLE A

Zero Order Correlation Matrix

	Voc	Comp	ArithComp	ArithConc	ArithApp	Spell	Ao	IO	TStud4	TStud3
Comp	.84									
ArithComp	.58	.61								
ArithConc	.75	.75	.75							
ArithApp	.72	.75	.70	.84						
Spell	.73	.71	.62	.69	.64					
Ao	.81	.80	.59	.75	.71	.72				
IO	.62	.60	.49	.63	.60	.49	.61			
TStud4	-.16	-.13	.02	-.11	-.08	-.03	-.23	-.16		
TStud3	-.10	-.10	-.09	-.16	-.07	-.05	-.10	-.07	-.02	
TTV	-.30	-.27	-.32	-.28	-.21	-.32	-.30	-.17	.19	.02
STeRace	.27	.21	.15	.17	.16	.22	.28	.19	-.10	-.07
STeExp	.13	.22	.27	.22	.22	.17	.23	.23	.01	.08
STePrep	.10	.08	.15	.09	.04	.11	.02	.05	-.04	-.08
STeSing	-.33	-.32	-.25	-.25	-.23	-.24	-.28	-.40	.11	.11
STeJob	-.20	-.19	-.12	-.16	-.13	-.16	-.19	-.18	-.02	.04
STeAdm	-.18	-.14	-.05	-.08	-.08	-.20	-.23	-.22	.17	-.06
SWTWS	.35	.32	.28	.37	.31	.29	.38	.28	-.25	-.13
SClSize	.07	.05	-.07	-.02	-.00	-.06	-.01	-.03	-.22	.04
SSplit	.31	.24	.23	.31	.28	.28	.31	.33	-.18	-.04
SClWh	.27	.24	.20	.25	.24	.18	.31	.22	-.28	-.14
SClL25	.19	.20	.21	.23	.20	.19	.20	.17	-.01	.05
SchSize	-.04	-.08	-.13	-.12	-.12	-.09	-.10	-.14	-.13	.12
SchRace	-.39	-.34	-.30	-.38	-.32	-.26	-.42	-.31	.29	.16
SchLib	.10	.14	.06	.12	.12	.03	.13	.13	-.09	-.01
SchResPr	.01	.01	-.03	.03	-.02	-.07	-.04	.02	-.23	-.04
NSMag	.20	.23	.17	.22	.19	.18	.26	.21	.03	-.04
NSHelp4	-.26	-.21	-.21	-.21	-.22	-.34	-.29	-.08	.22	.01
NSHelp3	-.02	-.01	.05	-.03	-.09	-.07	-.11	-.05	.01	.17
NSZoo	-.07	-.11	-.03	-.08	-.08	-.06	.02	-.00	.02	-.02
NSFEdSH	-.09	-.15	-.19	-.09	-.16	-.08	-.15	-.12	.02	-.08
NSFEdHS	-.11	-.08	.00	-.06	-.03	-.03	-.11	-.11	.13	.12
NSFEdVo	-.04	.04	.01	-.04	-.08	-.02	-.07	-.02	-.06	.00
NSFEdND	.07	.03	.04	-.04	.02	.05	.09	.03	-.01	.06
NSFEdBS	.27	.21	.20	.24	.25	.16	.27	.20	-.10	.01
NSFEdMS	.22	.20	.17	.25	.23	.17	.26	.23	-.04	-.09
BTardy	-.30	-.27	-.37	-.34	-.28	-.31	-.24	-.25	-.07	-.02
BNoSch	-.24	-.28	-.18	-.22	-.19	-.09	-.23	-.22	.09	.07
BStAsMS	.21	.16	.17	.21	.21	.19	.21	.30	-.06	-.08
BStAsHS	-.03	-.06	-.04	-.01	.00	-.09	.03	-.06	-.15	-.11

TABLE A (con'd)

	Voc	Comp	ArithComp	ArithConc	ArithApp	Spell	Ao	IQ	TStud4	TStud3
BFriend	-.12	-.11	-.08	-.11	-.11	-.13	-.12	-.12	.20	-.01
BRace	.29	.27	.26	.34	.31	.23	.35	.30	-.32	-.12
BSex	-.02	-.08	-.09	.01	.05	-.13	-.09	.11	-.11	-.10
BSAgG11	-.27	-.26	-.25	-.28	-.27	-.24	-.21	-.26	.06	-.07
BMetro	.10	.06	.02	.06	.04	.06	-.02	-.04	.06	.01
BRural	-.18	-.13	-.09	-.11	-.12	-.10	-.07	-.00	-.01	.01
BNNPar	-.15	-.14	-.11	-.18	-.20	-.17	-.16	-.16	.11	.10
BPEdDif	.01	.00	.04	-.02	.04	.04	-.01	.08	.10	.20
BFSizeW	-.00	.04	.09	.15	.11	.05	.08	.10	-.31	-.09
BFSizeNW	-.33	-.28	-.28	-.37	-.33	-.26	-.35	-.33	.25	.12
BWorkW	.14	.08	.13	.16	.11	.14	.11	.02	-.05	-.08
BWorkNW	-.21	-.24	-.22	-.28	-.26	-.18	-.27	-.22	.29	.08
BFAgL30	-.09	-.14	-.14	-.12	-.14	-.13	-.14	-.13	.04	-.13
BFAg36	.15	.10	.12	.12	.12	.14	.22	.20	-.08	.09
BFAg41	-.02	-.01	-.01	.01	-.02	-.09	.03	.06	.04	-.04
BFAgG46	.01	.03	.07	.03	.08	.01	-.04	.00	.02	-.02
BFAgM	-.07	-.06	-.04	-.04	-.01	-.09	-.09	.07	-.00	.05
BAgDifW	.01	.05	.03	.06	.06	.05	.12	.06	-.11	-.07
BAgDifNW	-.08	-.11	-.20	-.23	-.18	-.13	-.14	-.15	.13	.09

TABLE A (con'd)

	TTV	STERace	STeExp	STePrep	STeSing	STeJob	STeAdm	SWTWS	SClSize	SSplit
STeRace	-.15									
STeExp	-.19	.10								
STePrep	.08	.20	-.02							
STeSing	.21	-.07	-.13	-.05						
STeJob	.10	-.08	.02	-.10	.10					
STeAdm	.13	-.37	-.09	-.02	.12	-.15				
SWTWS	-.29	.72	.20	.09	-.09	-.16	-.21			
SClSize	-.19	-.23	-.07	-.13	-.03	-.04	.12	-.01		
SSplit	-.16	.02	.18	.06	-.21	-.13	-.27	.12	-.01	
SClWh	-.11	.37	.12	.01	-.06	-.01	-.24	.64	.17	.03
SClL25	-.23	.19	.15	.10	.00	.14	-.0[illegible]	.27	-.09	.26
SchSize	.03	.11	-.26	.12	.13	-.21	.27	.23	.51	-.28
SchRace	.33	-.49	-.26	-.01	.06	-.01	.35	-.78	-.25	-.26
SchLib	-.17	-.26	.24	-.37	-.30	.21	.08	-.09	.18	.22
SchResPr	-.23	-.01	-.18	-.06	-.20	.21	-.24	.03	.38	.10
NSMag	-.15	-.01	.16	.11	-.26	.04	-.04	.05	.06	.12
NSHelp4	.11	-.23	-.06	-.16	.04	-.01	.20	-.30	-.04	-.17
NSHelp3	-.03	-.11	-.04	.08	.04	.01	.05	-.11	-.11	-.04
NSZoo	-.03	-.19	-.04	-.10	-.03	.05	.10	-.14	.04	-.00
NSFEdSH	.06	-.03	-.18	.01	.09	-.03	.07	.04	.06	-.12
NSFEdHS	.11	-.04	.12	.00	.10	-.05	.10	-.06	-.01	-.07
NSFEdVo	.03	-.10	-.07	-.01	.11	.11	-.05	-.14	.04	-.12
NSFEdND	-.11	.12	-.01	.03	-.07	.00	.09	.04	-.00	.03
NSFEdBS	-.16	.03	.23	.05	-.10	.02	-.13	.10	-.03	.23
NSFEdMS	-.18	.17	.10	.00	-.18	.01	-.20	.17	.01	.15
BTardy	.23	-.15	-.15	-.01	.13	.08	.04	-.19	-.05	-.15
BNoSch	.13	.08	-.07	.02	.11	.14	-.06	-.08	-.15	-.07
BStAsMS	-.03	.18	.21	.07	-.13	.04	-.10	.16	-.08	.20
BStAsHS	.16	-.03	-.09	-.01	.06	.05	.02	-.03	.04	-.01
BFriend	.16	-.18	-.16	.06	.09	-.05	.22	-.21	.05	-.23
BRace	-.29	.46	.16	-.00	.00	.04	-.27	.83	.21	.16
BSex	.20	-.06	.01	.01	.00	-.05	-.02	-.05	.01	.06
BSAgG11	.15	-.08	-.15	.02	.07	-.08	.11	-.10	.15	-.04
BMetro	-.18	.12	-.01	.01	-.03	.07	-.15	.12	-.03	.11
BRural	.14	-.04	-.08	.00	.01	.01	-.02	-.06	-.07	-.09
BNNPar	.05	-.10	-.01	.00	.09	.04	.09	-.25	-.03	-.09
BPEdDif	.09	.01	.03	-.02	.05	.05	-.08	-.07	-.08	.00
BFSizeW	-.14	.28	.09	-.02	.12	.01	-.13	.54	.15	.09
BFSizeNW	.29	-.43	-.20	-.09	-.02	-.06	.22	-.70	-.06	-.15
BWorkW	-.25	.29	.08	.01	-.02	.08	-.13	.44	-.03	.08
BWorkNW	.28	-.39	-.16	-.04	.01	.03	.26	-.67	-.18	-.13
BFAgL30	.05	-.06	-.19	-.01	.08	.11	-.07	-.14	.10	-.06
BFAg36	-.19	.15	-.01	-.02	-.12	.01	-.19	.16	.00	.02
BFAg41	.00	.05	.11	-.14	-.05	-.01	.05	.08	.06	.05
BFAgG46	.16	-.10	-.02	.08	.02	-.10	.08	-.11	-.01	.05
BFAgM	.06	-.10	.04	-.13	-.09	.03	.02	-.10	-.16	.11
BAgDifW	-.20	.21	.01	-.06	.06	-.00	-.05	.37	.11	.01
BAgDifNW	.21	-.18	-.09	-.03	.07	.05	.05	-.49	-.08	-.11

TABLE A (con'd)

	SChlWh	SC1L25	SchSize	SchRace	SchLib	SchResPr	NSMag	NSHelp4	NSHelp3	NSZoo
SC1L25	-.36									
SchSize	.24	-.07								
SchRace	-.77	-.12	-.19							
SchLib	-.12	.26	-.18	-.07						
SchResPr	-.03	.11	-.11	-.17	-.00					
NSMag	-.02	.19	-.07	-.05	.14	.13				
NSHelp4	-.27	-.09	-.07	.29	.05	-.02	-.07			
NSHelp3	-.10	.12	.01	.11	-.03	-.05	-.01	.12		
NSZoo	-.11	-.01	-.05	.11	.16	.15	.02	.22	-.06	
NSFEdSH	.12	-.09	.17	-.06	-.11	-.02	-.14	.08	-.06	.01
NSFEdHS	-.11	.05	.11	.10	.03	-.13	-.07	.16	.10	.16
NSFEdVo	-.04	-.01	.05	.03	-.06	.00	.01	-.03	.10	-.11
NSFEdND	-.13	.16	.05	.05	.09	.03	.05	-.04	.08	-.02
NSFEdBS	.13	.03	-.21	-.17	.10	-.03	.07	-.18	-.06	-.03
NSFEdMS	.14	.02	-.23	-.16	.07	.21	.26	-.11	-.13	.09
BTardy	-.15	-.11	-.00	.23	.02	.01	-.02	-.03	-.11	.07
BNoSch	-.11	-.03	-.06	.13	-.10	-.09	-.03	.06	-.09	-.04
BStAsMS	.13	.01	-.20	-.16	-.03	.01	.04	-.08	-.03	-.04
BStAsHS	.03	-.03	.15	-.03	.04	.01	.03	.01	-.04	-.02
BFriend	-.15	.02	.17	.26	-.07	-.11	.02	.14	-.01	.06
BRace	.71	.22	.26	-.82	.06	.13	.04	-.27	-.08	-.07
BSex	.01	-.08	.00	.03	.02	-.03	-.06	-.06	-.14	.03
BSAgG11	-.10	-.02	.19	.09	.03	-.04	.10	.06	-.03	.01
BMetro	.05	.08	-.06	-.16	.04	.12	.09	-.08	.05	-.05
BRural	-.07	-.02	-.01	.11	.00	-.05	-.03	-.01	.02	.00
BNNPar	-.33	.02	-.05	.21	.04	-.05	.02	.14	.13	.04
BPEdDif	-.04	-.10	-.08	.08	-.09	-.06	-.07	-.01	-.04	-.02
BFSizeW	.48	.07	.25	-.53	-.00	.04	-.08	-.16	-.15	-.08
BFSizeNW	-.60	-.19	-.16	.70	-.05	-.05	-.09	.24	.04	.09
BWorkW	.33	.11	-.00	-.38	.02	.10	-.01	-.12	.06	-.08
BWorkNW	-.57	-.18	-.23	.66	-.01	-.10	.01	.20	.02	.10
BFAgL30	-.02	-.10	.04	.03	.05	.03	-.04	.11	-.03	.01
BFAg36	.02	.21	.04	-.13	-.05	.14	.12	-.03	-.07	.09
BFAg41	.11	-.00	-.00	-.12	.16	-.06	-.05	.00	-.05	-.12
BFAgG46	-.07	-.10	-.01	.15	-.04	-.14	-.05	-.13	-.01	-.01
BFAgM	-.07	-.06	-.24	.08	.11	.02	-.05	.12	.08	.06
BAgDifW	.26	.12	.21	-.34	-.02	-.09	.00	-.14	-.15	-.00
BAfDifNW	-.42	-.13	-.14	.48	-.06	-.06	-.03	.08	.06	.06

TABLE A (con'd)

	NSFEdSH	NSFEdHS	NSFEdVo	NSFEdND	NSFEdBS	NSFEdMS	BTardy	BNoSch	BStAsMS	BStAsHS
NSFEdHS	-.24									
NSFEdVo	-.21	-.20								
NSFEdND	-.20	-.18	-.16							
NSFEdBS	-.18	-.17	-.15	-.14						
NSFEdMS	-.15	-.14	-.12	-.12	-.11					
BTardy	.08	.01	-.01	-.03	-.06	-.07				
BNoSch	.02	.10	.04	-.08	-.10	-.06	.22			
BStAsMS	-.16	.00	-.08	.02	.28	.09	-.06	.03		
BStAsHS	.02	-.03	.13	.02	-.08	-.06	.06	-.06	-.15	
BFriend	.05	.08	.01	.01	-.14	-.21	.08	.05	-.20	.11
BRace	.08	-.09	-.07	.01	.11	.12	-.17	-.14	.10	.02
BSex	.04	-.02	-.01	-.01	.06	-.02	.09	-.06	.05	.15
BSAgG11	.08	-.01	.07	-.09	-.08	-.11	.37	.20	-.09	.05
BMetro	-.10	.05	.08	-.06	.07	.11	.05	.02	-.01	-.06
BRural	.15	-.01	-.04	-.02	-.00	-.13	.22	.19	.05	-.06
BNNPar	-.10	.20	-.09	.04	-.08	-.07	.06	.20	.00	-.06
BPEdDif	-.06	-.11	.00	.11	-.01	.17	-.07	-.00	-.02	-.05
BFSizeW	.14	-.06	-.08	-.02	.01	-.01	-.04	-.02	.03	-.01
BFSizeNW	-.02	.09	-.03	.00	-.13	-.13	.27	.11	-.07	-.02
BWorkW	-.03	.01	-.14	.17	.04	.12	-.11	-.10	.17	-.08
BWorkNW	-.07	.08	.07	.00	-.05	-.07	.18	.13	-.06	-.05
BFAgL30	.05	-.01	.11	-.07	-.06	-.03	.06	.09	-.07	.14
BFAg36	.04	-.05	.03	-.02	.00	.16	-.04	-.07	.00	-.05
BFAg41	.03	-.12	-.13	-.08	.11	.18	-.06	-.19	-.03	-.07
BFAgG46	-.11	.01	.01	-.00	-.02	-.08	.05	-.09	-.00	.00
BFAgM	-.02	-.08	-.07	-.07	.12	-.05	-.04	.01	.02	-.07
BAgDifW	.10	-.10	-.01	-.11	.06	.09	-.02	-.10	-.04	-.06
BAgDifNW	-.05	-.01	.03	.08	-.05	-.05	.17	.12	-.02	.01

TABLE A (con'd)

	BFriend	BRace	BSex	BSAgG11	BMetro	BRural	BNNPar	BPEdDif	BFSizeW	BFSizeNW
BRace	-.20									
BSex	.09	-.02								
BSAgG11	.11	-.06	-.05							
BMetro	-.23	.08	-.18	.07						
BRural	-.03	-.03	.01	.13	-.13					
BNNPar	.02	-.33	-.06	.08	.07	.04				
BPEdDif	-.10	-.09	.06	-.19	-.05	.00	-.08			
BFSizeW	-.19	.69	.03	.04	-.02	.00	-.21	-.10		
BFSizeNW	.18	-.84	.02	.16	-.10	.09	.22	.07	-.57	
BWorkW	-.10	.42	-.07	-.05	.02	.00	-.10	-.02	.15	-.35
BWorkNW	.20	-.80	.02	.03	-.11	.01	.25	.11	-.55	.65
BFAgL30	.06	-.09	-.07	.16	.10	-.00	.09	-.11	-.07	.05
BFAg36	-.10	.19	-.02	-.02	-.02	.03	-.15	.06	.20	-.15
BFAg41	-.10	.10	.03	-.01	-.07	-.07	-.12	.08	.05	-.05
BFAgG46	.03	-.16	.15	.07	-.02	-.04	.04	.13	-.02	.16
BFAgM	-.08	-.13	.00	.03	-.05	.15	.12	-.10	-.07	.01
BAgDifW	-.11	.43	.03	.02	.05	-.03	-.16	.03	.35	-.36
BAgDifNW	.10	-.59	.04	.16	-.08	.01	.16	.09	-.40	.57

	BWorkW	BWorkNW	BFAgL30	BFAg36	BFAg41	BFAgG46	BFAgM	BAgDifW
BWorkNW	-.34							
BFAgL30	-.04	.08						
BFAg36	.02	-.11	-.20					
BFAg41	.01	-.12	-.13	-.26				
BFAgG46	.01	.10	-.13	-.27	-.17			
BFAgM	-.11	.05	-.05	-.11	-.07	-.07		
BAgDifW	.22	-.34	-.17	.16	.16	.08	-.09	
BAgDifNW	-.25	.53	.00	-.10	-.04	.30	-.05	-.25